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| **Lesson Title: Targets of opportunity: Blue Marble Matches: Exploring Earth’s Features** |
| **Subject area / course / grade level: Science/ Geography 4th Grade** |
| **Introduction:** Geologic processes help to shape the Earth’s crust |
| **Lesson Length 60 minutes** |
| **Materials: computers, Student Activity guide, BMM Explore Cards, Feature Image Charts** |
| **Lesson Overview:**  This activity is designed to introduce students to geologic processes on Earth and how to identify geologic features in images. It will also introduce students to how scientists use Earth to gain a better understanding of other planetary bodies in the solar system. NASA materials for this lesson can be found at <http://ares.jsc.nasa.gov/ares/eeab/BMM.cfm> |
| **Tennessee Standards:**  **GLE 0407.7.1 Investigate how Earth’s geologic features change as a result of erosion and deposition.**  **GLE T/E 407.1 Study how tools and technology solve problems and answer questions**  Check 0407.7.2Design an investigation to demonstrate how erosion and deposition change the earth’s surface. |
| **Lesson objective(s):**  Students will:  1. Identify common characteristics to describe features in images.  2. Identify geologic features and how they form on Earth.  3. Create a list of criteria to identify geologic features.  4. List observations, interpretations, and draw conclusions about processes that shape the surface of the Earth  . |
| **ENGAGEMENT**   * Teachers engage students using an activity, image, or discussion to focus students’ thinking on an important aspect or learning outcome(s) of the activity. * The teacher will begin by showing photos of different features. After entertaining ideas from students about how these characteristics appeared, the teacher and students will discuss the different ways that geologic features are created. * Students make observations and describe what they see in an image using descriptive words or characteristics. |
| **EXPLORATION**   * Students actively explore and make discoveries using hands‐on materials. Students develop concepts, processes and skills to establish an understanding of content. * Students discuss background information to gain knowledge & understand geologic processes on Earth. Students explore images of Earth to develop a list of identification criteria used to identify different features. * Students compare pictures of other planets to find similar geologic features. |
| **EXPLANATION**   * Student explanations should precede introduction of terms or explanations by the teacher. What questions or techniques will the teacher use to help students connect their exploration to the concept under examination? * Students communicate and explain concepts that they have been exploring. * Students use formal language and vocabulary associated with content. * Students will identify Aeolian processes, Impact processes, Fluvial processes, and volcanic processes * Students use identification criteria to reinforce feature recognition. Students review and revise criteria as necessary. Students use vocabulary learned from previous parts of the activity. |
| **ELABORATION**   * Students use identification criteria to reinforce feature recognition. Students review and revise criteria as necessary. * Students use vocabulary learned from the previous parts of the lesson. * Students apply knowledge of Earth‐based geologic features to identify features in images of other planetary bodies. * Students will complete charts showing comparison of formations. |
| **EVALUATION**   * Students will be able to identify different features seen in the images and explain how those formations occurred. Additionally, they will compare those features to similar features found on other planets. * This should be embedded throughout the lesson as well as at the end of the lesson * Students create a list of observations and interpretations to draw conclusions about processes that shape the surface of other planetary bodies. * Students will share and compare the results of their findings.   **Useful Websites for Additional Background Knowledge:**  Gateway to Astronaut Photography: http://eol.jsc.nasa.gov   Planetary Photojournal: http://photojournal.jpl.nasa.gov   NASA Science: http://nasascience.nasa.gov/   NASA Earth Observatory: http://earthobservatory.nasa.gov   NASA Career Resources: http://www.nasa.gov/about/career/index.html   NASA Career Resources: http://www.nasa.gov/audience/forstudents/careers‐index.html   People involved in Solar System Exploration: http://solarsystem.nasa.gov/people/index.cfm   Exploring the Planets: http://www.nasm.si.edu/etp/ |